INTRUSION DETECTION FOR SUBMERGED DATACENTERS

CLAIM OF PRIORITY

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 62/286,961, entitled "Intrusion Detection for Submerged Datacenters" and filed on Jan. 25, 2016, and U.S. Provisional Patent Application Ser. No. 62/286,964, entitled "Artificial Reef Datacenter" and filed on Jan. 25, 2016, U.S. patent application Ser. No. 14/752,669, entitled "Underwater Container Cooling Via Integrated Heat Exchanger" and filed on Jun. 26, 2015, and U.S. patent application Ser. No. 14/752,676, entitled "Underwater Container Cooling Via External Heat Exchanger" and filed on Jun. 26, 2015, all of which are incorporated herein by reference in their entirety for all intents and purposes.

SUMMARY

[0002] This Summary is provided to introduce a selection of representative concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used in any way that would limit the scope of the claimed subject matter.

[0003] Briefly, one or more of various aspects of the subject matter described herein are directed towards a datacenter configured for operation while submerged in water. The datacenter includes one or more physically separable modules. The system also includes an intrusion detection system that has one or more intrusion detection sensors.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The present disclosure is illustrated by way of example and not limited in the accompanying figures in which like reference numerals indicate similar elements and in which:

[0005] FIG. **1** is an example representation of a submerged datacenter (configured in a plurality of modules) resting on the floor of a body of water, according to one or more example implementations.

[0006] FIG. **2** is a perspective view illustrating an intrusion detection system **200** incorporated into the submerged datacenter **100** shown in FIG. **1**.

[0007] FIGS. **3**A-**3**C are block diagrams representing examples of water-based power sources coupled to provide at least some needed power to a datacenter, according to one or more example implementations.

[0008] FIG. **4** is an example representation of a submerged datacenter having heat generated thereby used to generate power, according to one or more example implementations.

[0009] FIG. **5** is an example representation of a datacenter coupled to or incorporated into the base of a wind-driven turbine, according to one or more example implementations.

[0010] FIG. **6** is a flow diagram showing example operations for detecting intrusion of a submerged datacenter.

[0011] FIG. **7** is a flow diagram showing example operations for performing protective actions upon detection of an intrusion into a submerged datacenter.

[0012] FIG. **8** is a flow diagram showing example operations for rendering all in-datacenter data inaccessible, on a temporary basis, upon detection of an intrusion into a submerged datacenter.

[0013] FIG. **9** is a flow diagram showing example operations for permanently rendering all local data inaccessible upon detection of an intrusion into a submerged datacenter.

[0014] FIG. **10** is a block diagram representing an example submerged datacenter into which one or more aspects of various embodiments described herein may be implemented.

DETAILED DESCRIPTION

[0015] As cloud-based computing and cloud-based services grow, datacenters need to be provided to serve client customers. Customers want fast speeds (lowest possible latency) for their cloud applications. In order to satisfy customers, future datacenters need to be positioned as close as possible to the customer base, such as submerged in nearby bodies of water. At the same time, consideration needs to be given to privacy and security of the data contained in the datacenter.

[0016] Because datacenters may contain large amounts of valuable data, they are subject to intrusion. Submerged, or subsea datacenters may be subject to intrusion by unwanted natural or man-made phenomena, in particular divers, submarines, ROVs, trained sea mammals, capture devices, or other covert attempts to access the datacenter.

[0017] Briefly, examples of the disclosure provide a datacenter configured for operation while submerged in water. The datacenter includes one or more physically separable modules. The datacenter also includes an intrusion detection system that has one or more intrusion detection modules.

[0018] Another aspect of the disclosure is directed toward a method for detecting intrusion into a datacenter submerged in water. The method includes receiving data from a plurality of sensors. The method also includes processing the data received from the plurality of sensors to identify an anomaly that suggests a change in the environment. Moreover, the method includes initiating a search for an entity responsible for the anomaly, and identifying the entity by use of the plurality of sensors and an external database.

[0019] Yet another aspect of the disclosure is directed to a method for performing protective actions upon detection of an intrusion into a datacenter submerged in water. The method includes alerting network operations, broadcasting warnings into the surrounding environment, and ceasing network traffic. In addition, the datacenter will failover to a geo-replicated copy of the datacenter. The method also includes rendering all in-datacenter data inaccessible and rendering all local data inaccessible.

[0020] The present disclosure is generally directed towards providing monitoring and intrusion detection of subsea equipment, such as centrally managed computing resources and related support systems. More particularly, the subsea equipment may include a datacenter that is designed to be submerged, for example on the ocean floor or the floor of any body of water, such as a lake, a river, a flooded former quarry, and the like. The datacenter may be deployed relatively close to current and potential customers, and positioned in a way to take advantage of sustainable power that is also environmentally friendly and the massive heat sink provided by the water. By positioning the datacenter in deep water, such as anchoring it or sinking it to the ocean floor,